



Managing heterogeneous ns-3 experiments with NEPI

Alina Quereilhac, Thierry Turetti, Walid Dabbous

► To cite this version:

Alina Quereilhac, Thierry Turetti, Walid Dabbous. Managing heterogeneous ns-3 experiments with NEPI. WNS3 - Workshop on ns-3, Mar 2012, Desenzano, Italy. , 2012. hal-01270466

HAL Id: hal-01270466

<https://inria.hal.science/hal-01270466>

Submitted on 8 Feb 2016

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Managing heterogeneous ns-3 experiments with NEPI

Alina Quereilhac, Thierry Turletti, Walid Dabbous
{Alina.Quereilhac, Thierry.Turletti, Walid.Dabbous}@inria.fr

I – NEPI

➤ What is NEPI?

□ The Network Experimentation Programming Interface (NEPI), is an **experiment life-cycle management tool** that enables conducting heterogeneous experiments where PlanetLab nodes and Emulated nodes can be seamlessly integrated with ns-3 simulations.

➤ Objectives of NEPI

- Support all stages in the experiment life-cycle.
- Automate repetitive and complex tasks.
- Provide a platform-independent API.
- Make it easy to conduct experiments that mix heterogeneous platforms (simulators, emulators, physical testbeds).

II – Life-cycle support

➤ Stages in the life-cycle



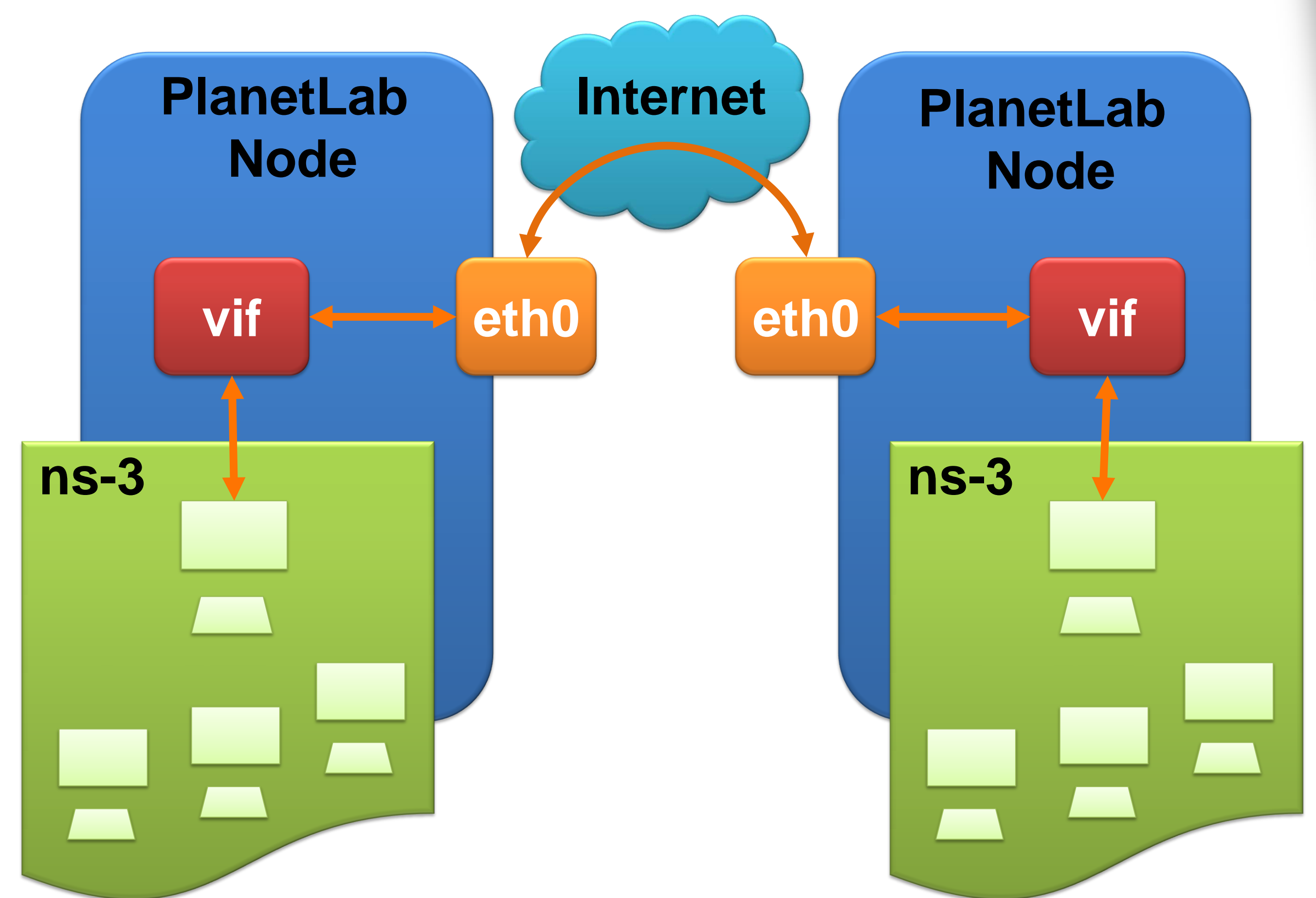
➤ Experiment design

- An experiment description (**ED**) is created by connecting **boxes**, representing experiment components, to other boxes on named ports called **connectors**. Each connector defines specific rules on how to create, configure and connect components during experiment deployment.

➤ Experiment execution

- The **ED** generated during design is used as the input for the Experiment Controller (**EC**). The **EC** is responsible for supervising the whole experiment, and instantiating the Testbed Controllers (**TC**) in charge of supervising the different experimentation platform instances involved in the experiment.
- Upon creation, the **EC** translates the **ED** into platform-independent messages (e.g. “create Node N”), and sends them to the corresponding **TCs**. When a **TC** receives a message, it performs a platform-specific action in response (e.g. a ns-3 **TC** would create a ns3::Node C++ object in the ns-3 simulation upon receiving a create node message).

III – Heterogeneous experiments



- NEPI allows to build scenarios where ns-3 simulated networks can be integrated with the PlanetLab network. This is achieved by connecting an edge node inside the simulation to a virtual interface in the PlanetLab node where the simulation is running. The traffic generated inside the simulation can then be tunneled across the Internet to reach other PlanetLab nodes.
- ns-3 simulations can also be integrated with emulated Ethernet networks, making it easy to inject in the simulation traffic generated by arbitrary unmodified applications.

IV – Graphical User Interface

- The Network Experimentation Frontend (NEF), is a Graphical User Interface for NEPI that allows to design experiments by drag & dropping and interconnecting boxes in a canvas.
- Deployment is done simply by selecting an option on the main Menu.
- NEF provides several runtime views to monitor the evolution of the experiment, such as:
 - **Topology View**, to change experiment configuration during runtime.
 - **Mobility View**, to view the 2D changes in mobile nodes
 - **Results View**, to list and retrieve experiment results